BIOLOGY TEACHERS LEVEL OF UTILIZATION AND AWARENESS OF INNOVATIVE TEACHING STRATEGIES IN THE TEACHING AND LEARNING OF BIOLOGY IN SECONDARY SCHOOLS

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Abstract: *This study investigated biology teachers' level of awareness and utilization of innovative teaching strategies in the teaching and learning of biology in secondary schools in Anambra state, Nigeria. A descriptive survey research design was used. The sample for the study is 150 biology teachers from 75 co educational school. The instrument used was developed by the researchers known as Teacher's Awareness and Utilization of Innovative Teaching Strategy Scale (TAUITSS) which was scrutinized by three experts from Department of Science Education one from Nwafor Orizu College of Education Nsugbe, another from Federal College of Education (Technical) Umunze and Nnamdi Azikiwe University Awka. The questionnaires were distributed by the researchers. Mean were used to answer the research question while t-test was used to test the hypotheses involving two mean, ANOVA was used to test the hypotheses involving more than two mean. The findings shows that there is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on gender, there is a significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on academic qualification and there is no significant difference between the mean ratings of teachers on the extent of utilization of innovative teaching strategy that can be used in the teaching of Biology in secondary*

schools based on gender. The last hypothesis showed that there is no significant difference between the mean ratings of teachers on the extent of utilization of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on academic qualification. Base on the findings, these recommendations were made, in order to improve the performance of students in Biology, teachers should consider using the innovative teaching strategies and this should as well be implemented in other levels where Biology is taught if performance in biology exams is to be improved and school administrators should be encouraged to improve on management of academic programmes by providing necessary innovative tools required for instructional purposes.

Keywords: *Biology; Awareness; Utilization; Innovative and Teaching Strategies*

Introduction

Teachers are at the frontiers of any educational activity and they go a long way in acquiring the necessary knowledge needed to impart their students Aniekwu (2018). These teachers are the once being trained in various disciplines so as to enhance their teaching skills in their respective subjects which includes; Biology, Chemistry, Physics among others. In the course of this training, various measures are being put in place so as to reduce the burden associated with teaching and also enhance easy understanding of the subjects. Part of those measures is innovative teaching strategies which have emerged as a result of research and development, hence when utilized by teachers, may tends to give the desired educational result (Aniekwu, 2018).

This educational result contributes to the main aim of education which is not only to make students literate but to also improve their knowledge, build self-confidence and their ability to think rationally for the benefit of the society Saraki (2015). For a society to grow and make progress, education is the tool they need because it is not only to imparts knowledge, skill and right types of values but also builds human capital which begets, drives and sets technological innovation and economic goals in motion for a nation Obidume (2011). Okoye (2012) asserted that many advances in science and technology have helped nations to promote efficiency, self-reliance and the overall well-being of humanity through inventions/innovations in sectors such as health, agriculture, transportation, telecommunication, mining etc. That is one of the

reason education in Nigeria is one major sector the government always put in yearly budget (Obidume, 2011)

In Nigeria the National policy on Education (FRN, 2004) clearly spells out the objectives of science teaching from pre-primary to tertiary levels. Laying more emphasis on the secondary level, it entails equipping students to live effectively in our modern age of science and technology. Since science is a process that aids development of the society, the global change in science curriculum arising from knowledge explosion in science and technology development demands a qualitative teaching.

There is no gainsaying that education today faces several gaps, which only can be addressed through a relevant and befitting teaching strategy; some of the gaps created in our educational system as a result of technology include: The world that young people experience outside the classroom and the world within, the skills students learn in school and those they will need later in life, those who have access to high quality education and tools and those who do not. All are geared towards teaching strategy (Saraki, 2015).

Teaching strategy according to Nwokoye (2012) is a designed interaction carried out in the classroom which could be carefully and systematically followed to teach a concept, topic or an idea. There are many strategies which when utilized by teachers may improve student's understanding, thus creates an innovative teaching and learning in secondary schools. An innovative strategy is referred to as a design that is full of new or purposively reconstructed existing ideas, methods and equipment or to combine various teaching strategies to develop a new one (Gbadamosi, 2013).In science education, innovation is greatly needed in order to foster greater scientific literacy. Innovation is a deliberate, systematic, novel, specific and persistent change in the system of a particular society which is aimed at improving the system or creating a new one for a more effective and efficient means of attending to the educational needs of the social group in their social environment (David, 2018).

The innovative strategies are as follows: Inquiry-Based learning (IBL), Quick Response Codes(QRC), Project-Based Learning (PBL),Wisely Managed Classroom Technology (WMCT), Jigsaws Strategy (JS), Computer Assisted Instruction (CAI), Ethno-Science Instruction (EI), Computer Supported Collaboration (CSC), Multimedia Integrated Instruction (MII) and Projected Video Packaged Instruction (PVPI) among others. Many of these strategies take students to levels of learning they never thought possible when properly used by the teacher. Sometimes it appears impossible to fully utilize these innovative strategies due to poor orientation on the side of teachers, lack of facilities in schools, government policies. But generally the benefits are quirt

enormous which has been a good one for development of any nation if well managed in a classroom setting may bring about the best out of the knowledge with the use of technology (Davis, 2017).

Wisely Managed Classroom Technology has to do with looking in to the use of various technology gadgets owned by the students. Many schools have become one-to-one schools where each student has his or her own technology item (tablet or computer) to work with each day. There is a delicate balance with technology use in the classroom. For this reason, teachers must use technology in a wisely managed way and with a variety of activities (Owen, 2013). Several activities that lead to student engagement are Google Docs, YouTube, videos, among others. These innovative apps and websites can help teachers engage their students, remind them about upcoming assignments and homework, provide visual learning through videos, organize student learning, provide group collaboration and provide check-ups on learning through games and online quizzes especially when it has to do with multimedia integrated instruction (Owen 2013).

Multimedia integrated Instruction is the use of multimedia applications which is any application that uses a collection of multiple media sources e.g. text, graphics, images, sound/audio, animation and/or video in the process of teaching and learning (Nweke, 2010). It involves delivering lesson contents with planned instructions that involve exposing students to multimedia information. In this type of instruction, the teacher uses a combination of text, graphics, simulations, animations, and videos, projected on a slide or board in the teaching process. In this study, multimedia integrated instructions involved the teacher projecting graphics, animated text of lesson contents, pictures, and simulation videos explaining the contents on a slide or board in the course instruction especially in teaching of subject like Biology.

It is the duty of the Biology teacher to gain mastery of these instructional strategies so as to be able to use it in teaching and learning process. Therefore a teacher who is not aware of the variety of such instruction innovational strategies can neither attempt nor utilized them accurately (Udeani & Okafor 2012). According to Okpala, Amobi and Uche (2022) utilization of an innovation in education means to take up or accept an innovation and make use of it in the educational sector. It simply means having new creative ideas implemented. This is necessary because a healthy system should tend towards inventing new procedures, move towards new goals, produce new kind of products, diversify itself and become more rather than less differentiated over a period of time. In Biology, like any other science subject, innovation can be in using new teaching methods addition of new ideas in the curriculum

content, learning experience, and introducing new/modern instructional material as well as adopting a new change in evaluating the outcomes of Biology teaching (David, 2018). Using Innovative strategies in teaching Biology may be the introduction of new ideas and methods accompanied by an equally new change in the style of evaluating the outcomes of biology learning (James 2011).

Innovative strategies in Biology were borne as a result of the fact that different situations, topics to be taught, learners' cognitive readiness, concept being taught, skills intended to be developed in learners, demand a different approach. Researches have shown some factors that hinder effective utilization of innovative teaching strategies. They include; insufficiency of intellectual efforts in finding ways to improve educational activity efficiency, predominance of the desire to use the products of someone else's innovation over developing their own abilities and creating original educational products, lack of initiative (Iwegne, 2014). The author further asserted that in teaching ecology in senior secondary one the factors that hinders teaching included inadequate professional development and lack of computer facilities. According to Eze (2017) state that staying up to date, widespread access equipment had a strong degree of mitigating on the problem that he encounted during a study on the factors that affect the utilization of inquiry base strategy on the academic achievement of Biology student on the concept of genetics. All these hindrances may lead to unawareness of educational policies especially in teaching and learning subject like Biology (Nadezhda, 2019).

Olumorin, (2010) asserted that awareness of educational policies usually forms the backbone of the utilization and productivity level of any educational programme. He further stated that it is when an individual is aware of the principles and content policy that such an individual can cultivate the right type of attitude that will result in improved productivity and performance through awareness. Therefore, teachers' awareness of the innovative strategies is a decision on the utilization of the innovative strategies which is based on the teacher's knowledge on the existence of the innovative strategies. Some researchers have suggested level of awareness and utilization of innovative teaching strategies in teaching some science subjects. According to Olagunju and Abiona (2013) male teachers‟ perception of utilization of instructional materials in teaching is higher than that of the female teachers. Jone and Dindia (2014) reveal male and female teachers have no significance differences in level of awareness and utilization of innovative teaching in Mathematics. Oludipe (2010) noted that students taught with innovative teaching strategy like inquiry base performed better than those without it at Ijebu Ode local government of Ogun state. Nwagbo and Obiekwe (2010)

reveal that experimental group which was exposed to wisely managed classroom Technology for a period of four weeks while the control group which was exposed to traditional teaching method that the result revealed that wisely managed classroom technology was more effective in facilitating students' achievement in ecological concept than traditional method. Also, Jone, Dinda and Oludipe (2010) reported that the students taught using jigsaw does not perform better than those taught using normal lecture method. Could these researchers point of view in innovative teaching strategies be the reason of declining nature of students' performance in Biology in WAEC following the report of Chief examiners' report?

According to WAEC Chief Examiner report 2009-2018, students performed poorly in Biology compare to other science subjects such as Chemistry and Physics. This may be likely connected to poor embracing of innovative teaching strategies in teaching the subject (Iwegne 2014). This is what prompted this study to investigate the Biology teachers' level of utilization and awareness of innovative teaching strategies in the teaching and learning of Biology in secondary schools in Anambra state.

Brain- Base Learning Theory is a learning strategy that is based on the structure and function of the human brain. Brain -Based Learning Strategy is a combination of several planned action designed to enhance students' and teachers ability to process and integrate information in meaningful ways through use of innovations, under a threat-free atmosphere. It emphasizes meaningful learning instead of memorization or rote learning and gives teachers that free hand in utilization and awareness of said innovative strategy. The findings of neuroscience and psychology provide us with many opportunities of brain compatible implications for classrooms (Achor & Gbadamosi 2020). BBLS involves learners acquiring knowledge and teachers acquired knowledge while applying a strategy that depends on how the brain functions. It involves a strategy that utilizes learners' cognitive endowments. Understanding how the brain learns and relating it to the educational field resulted in this concept known as brain-based learning. The strategy has to do with how the brain learns, assimilates, relate, thinks, associate and remember in a threat-free but in highly challenged environment like during the total lockdown in Nigeria during the first wave of COVID- 19 in which innovative teaching like use of e-learning to teach Chemistry, Biology and other related science subject to avoid physical contact of individual during the period (Obikezie, Abumchukwu & Eke , 2020) .

Purpose of the Study

The main purpose of the study is to ascertain the Biology teachers' level of utilization and awareness of innovative strategies in secondary schools. Specifically, the study sought to:

1. Determine the level of secondary school Biology teachers' awareness of the innovative teaching strategies;
2. Determine the level of secondary school Biology teachers' utilization of the innovative teaching strategies in their teaching;
3. Examine the factors that could hinder the effective utilization of the innovative teaching strategies in the teaching of Biology in secondary schools;
4. Proffer solution to the problems surrounding the effective utilization of the innovative teaching strategies;

Research questions

The following research question guided the study:

1. To what extent are Biology teachers aware of the innovative teaching strategies that can be used to teach biology in secondary schools?
2. To what extent do Biology teachers utilize the known innovative teaching strategies that can be used to teach Biology in secondary schools?
3. What are the factors that hinder the effective utilization of the innovative teaching strategies in the teaching of Biology in secondary schools?
4. What are solutions to the problems surrounding the effective utilization of the innovative teaching strategies in the teaching of Biology in secondary schools?

Research Method

The design adopted for the study was descriptive survey. It is one of the most reliable methods and the design that is appropriate for a large population. It is also a type that can be used to make selection of a relatively large sample of people from a pre-determined population for ease in data collection which serves as the basis on which the researcher makes inference about the wider population. The design is appropriate for the study because the findings of the study can be generalized using the sample which is representative of the entire population. The study was carried out in Anambra state which is made up of six education zones. The state has six education zones namely, Aguata, Awka, Nnewi, Onitsha, Ogidi and Otuocha with 256 public secondary schools. One hundred and fifty (150) Biology teachers were used in the study. Using purposive sampling method, 75 co educational schools were sampled. The rationale behind the sampling was to ensure greater coverage of all the education zones in Anambra state and because there are not too many Biology teachers. The instruments developed for the study was on Teacher's Awareness and utilization of Innovative Teaching Strategy Scale (TAUITSS) which was used to assess the level of teacher's awareness and use of innovative teaching strategies in secondary schools in Anambra state and was validated by three expects One from Nwafor Orizu College of Education Nsugbe, one from Faculty of education Nnnamdi Azikiwe University Awka and one from Federal college of Education (Technical) Umunze with reliabity of 0.78 using Cronbach Alpha. TAUITSS was composed four sections:

namely sections A, B, C, D and E. Section A were designed to generate demographic information while section B and C elicited information on Biology teachers' awareness and use of innovative teaching strategies respectively. Section B was designed on a four point scale of Very much Aware (VMA), Much Aware (MA), Aware (A), and Not Aware (NA) Section C was designed also on a four point scale of Very Often (VO), Often (O), Rarely (R) and Very Rarely (VR).Sections D and E determined the challenges surrounding the use of innovation teaching strategies and the solutions to the challenges respectively. Both sections D and E are designed on a four scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) all in grade point of 4, 3, 2 and 1. The data obtained from the respondents were analyzed using the mean and standard deviation for research questions. The decision of acceptance or rejection of the items in the questionnaire based on items means which are above the grand mean of 2.5.

Results

Research Question 1: To what extent are Biology teachers aware of the innovative teaching strategies that can be used to teach Biology in secondary schools?

Table 1Biology Teachers' Extent of Awareness of Innovative Teaching Strategies

S/N	**Innovative Strategies**	$\bar{x}$	**SD**	**Remarks**
1.	Inquiry-Based Learning (IBL)	3.40	1.86	Aware
2.	Quick Responses Codes (QRC)	1.84	1.01	Not Aware
3.	Project –Based Learning (PBL)	2.96	1.50	Aware
4.	Wisely Managed Classroom Technology(WMCT)	2.28	1.10	Not Aware
5.	Jigsaws Strategy (JS)	3.36	1.46	Aware
6.	Computer Assisted Instruction (CAI)	3.29	1.11	Aware
7.	Ethno-Science Instruction (EI)	2.06	0.94	Not Aware
8.	Computer Supported Collaboration (CSC)	2.41	0.88	Not Aware
9.	Multimedia Integrated Instruction (MII)	1.00	0.34	Not Aware
10.	Projected Video Packaged Instruction (PVPI)	2.81	1.22	Aware
Grand Mean		**2.54**		

Cut-Off mean = 2.50

Table 1 show that the mean of items 1, 3, 5, 6 and 10 are above the cut-off mean of 2.50. Thus, Biology teachers are aware of such innovative teaching

strategies as inquiry-based learning, project-based learning, jigsaw strategy; computer assisted instruction (CAI) and projected video packaged instruction. The grand mean of 2.54 shows that secondary school teachers of Biology are cognizant of innovative teaching strategies to a much aware extent.

Research Question 2: To what extent do Biology teachers utilize the known innovative teaching strategies that can be used to teach Biology in secondary schools?

Table 2: Biology Teachers Extent of Utilization of Innovative Teaching Strategies

S/N	**Innovative Strategies**	$\bar{x}$	**SD**	**Remarks**
1.	Inquiry-Based Learning (IBL)	1.35	0.63	Very rare
2.	Project –Based Learning (PBL)	3.61	1.13	Often
3.	Jigsaws Strategy (JS)	2.55	1.33	Rare
4.	Computer Assisted Instruction (CAI)	1.05	1.18	Very rare
5.	Projected Video Packaged Instruction (PVPI)	1.21	1.39	Rare
Grand Mean		**1.95**		

Table 2 shows that Biology teachers utilize inquiry-based learning to a very rare extent, project-based learning often, jigsaw strategy rarely, computer assisted instruction to a very rare extent and projected video packaged instruction to a rare extent. The grand mean of 1.95 shows that secondary school Biology teachers utilize innovative teaching strategies to a very rare extent.

Research Question 3: What are the factors that hinder the effective utilization of the innovative teaching strategies in the teaching of Biology in secondary schools?

Table 3: Factors that Hinder the Effective Utilization of the Innovative Teaching Strategies

S/N	**Item**	$\bar{x}$	**SD**	**Decision**
1.	Poor and inadequate computer accessibility	2.60	1.15	Accept
2.	Inadequate professional development and training	2.82	1.00	Accept
3.	Teachers attitudes and beliefs	1.80	1.53	Not Accepted
4	Duration of biology lesson	3.35	1.44	Accept
5	Lack of instructional resources	3.73	1.31	Accept

Cut-Off mean = 2.50

Table 3 reveals the responses of teachers on the factors that hinder the effective utilization of innovative teaching strategies. From the table it was discovered that the mean of items 1, 2, 4 and 5 are above the cut-off mean of 2.5. Thus, Biology teachers accept that the factors affecting the utilization of innovative teaching strategies include: poor and inadequate computer accessibility, inadequate professional development and training, duration of Biology lesson and lack of instructional resources.

Research Question 4: What are solutions to the problems surrounding the effective utilization of the innovative teaching strategies in the teaching of Biology in secondary schools?

Table 4: Solutions to the Problems Surrounding the Effective Utilization of the Innovative Teaching Strategies

S/N	Items	$\bar{x}$	SD	Decision
1.	Wide spread access to equipment	3.10	0.50	Accept
2.	Stay up-to-date Ability	3.45	1.31	Accept
3.	Teachers confidence in the skills	3.47	1.46	Accept
4.	Technical support	3.35	1.44	Accept
5.	Provision of instructional resources	3.73	1.31	Accept

Cut-Off mean = 2.50

Table 4 revealed responses of Biology teachers on the solutions to the problems surrounding the effective utilization of the innovative teaching strategies and it shows that the mean of items 1 to 5 are above the cut-off mean of 2.5. Thus, agree that the solutions to the problems surrounding the effective utilization of innovative teaching strategies include: wide spread access to equipment, staying up-to-date ability, teachers' confidence in the skills, technical support and provision of instructional resources.

Discussions

The findings of the study are discussed thematically under the following sub-headings:

Awareness Level of Innovative Teaching Strategies (ITS)

From the findings on table 1, it was revealed that secondary school Biology teachers are much aware of innovative teaching strategies. Biology teachers were aware of such innovative teaching strategies as inquiry-based learning, project-based learning, jigsaw strategy; computer assisted instruction (CAI) and projected video packaged instruction. This finding is inline with the work done by Obikezie, Abumchukwu and Eke (2020) reveal that 80.5% of the

teachers and students are fully knowledgeable during first wave of COVID - 19 in Nigeria and are ready to use the wisely managed classroom strategy due to its effectiveness and high productivity in the teaching and learning of Chemistry. The findings of the study also have a corresponding agreement on the work done by Udeani and Okafor (2012) in their findings show that there was a low level of science teachers on the implementation of jigsaw strategy due to lack of confidence on themselves to effectively control and manage their classroom during the lesson delivery.

Utilization of innovative Teaching strategies

From the findings on table 2, Biology teachers utilize known innovative instructional strategies to a very rare extent. It was observed Biology teachers utilize inquiry-based learning to a very rare extent, project-based learning often, jigsaw strategy rarely, computer assisted instruction to a very rare extent and projected video packaged instruction to a rare extent. This is at contrast with the work done by Jone, Dinda and Oludipe (2010) who reported that the students taught using Jigsaw does not performed better than those taught using normal lecture method of teaching. It also corresponds with Nwagbo & Obiekwe (2010) revealed that Jigsaw was not effective in facilitating students achievement in ecological concept. According to them the student had no knowledge of the topic been taught hence grouping the students in the jigsaw method proved abortive. Therefore the result statistically show that there was a low level of significant on the utilization of innovative teaching strategies used in the study considering the observed mean and SD gotten from the Biology Teacher's response on Research question Two above.

Factors that hinders the use of innovative teaching strategies

Table 3 reveals the factors that hinder the utilization of innovative teaching strategies include: poor and inadequate computer accessibility, inadequate professional development, training and duration of Biology lesson and lack of instructional resources. When there are no access to the concurrent computer technologies and its corresponding accessories, teachers may find it difficult to adopt innovative instructional strategies. Also, to adopt innovative instructional strategies, teachers need professional development programs. Where this is lacking, the adoption of innovative teaching strategies in teaching and learning is gravely hindered. Some of the innovative strategies require a lot of time both in planning and usage. Where the school timetable is overloaded with academic activities, teachers of Biology may find it difficult to use innovative teaching strategies, just as when the needed resources are lacking. The finding agrees with that Iwegne (2014) when he observed that some of the factors that hindered the effective use of project managed strategy as an instruction in teaching Ecology in senior secondary included inadequate professional development and lack of computer facilities.

Solutions to the factors that hinder the utilization of the innovative strategies

Table 4, reveals the possible solutions to the factor that hinder Innovative teaching strategies. It was obtained clearly that wide spread access to equipment, staying up-to-date ability, teachers' confidence in the skills, technical support and provision of instructional resources can help curb the challenges of utilization of innovative teaching strategies. This findings is in agreement with the work done by Ezeh (2017) where he asserted that staying-up-to-date, widespread access equipment had a strong degree of mitigation on the problem that he encountered during a study on the factors that affect the utilization of inquiry based strategy on the academic achievement of Biology student on the concept of genetics

Conclusion

The study revealed the following findings which have been presented as per the study hypothesis. The first hypothesis showed that there is no significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on gender. The second hypothesis indicated that there is a significant difference between the mean ratings of teachers on the awareness of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on academic qualification. The third hypothesis revealed that there is no significant difference between the mean ratings of teachers on the extent of utilization of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on gender. The last hypothesis showed that there is no significant difference between the mean ratings of teachers on the extent of utilization of innovative teaching strategy that can be used in the teaching of Biology in secondary schools based on academic qualification

Recommendations

1. In order to improve the performance of students in Biology, teachers should consider using the innovative teaching strategies and this should as well be implemented in other levels where Biology is taught if performance in biology exams is to be improved.
2. School administrators should be encouraged to improve on management of academic programmes by providing necessary innovative tools required for instructional purposes.

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